CHAPTER 4: POLICY CONCLUSIONS AND RECOMMENDATIONS

Introduction

The policy aim expressed at the Lisbon[1] summit (March 2000)– and reiterated at the recent spring Barcelona summit (March 2002) – to develop the European Union into the most efficient knowledge-based economy in the world, and hence raise substantially the amount of R&D and innovation expenditures in the European Research Area (ERA), is undoubtedly from a policy commitment perspective, a useful target, raising the awareness with national policy makers and the public at large of the importance of research, development and innovation for European long term sustainable growth, employment and welfare. Unfortunately, contrary to other, more directly policy related, macro-economic targets such as the EMU criteria of monetary unification in the nineties, the targeting of quantitative measures in the area of innovation, research and development is, to put it simply, more easily said than done. It has, as a matter of fact, been tried many times before in individual EU member countries (one may think of Harold Wilson White Heat policy campaign in the late 60's in the UK). The attempt to set out such policy targets within the context of the development of a European Research Area raises even more fundamental challenges. As the analysis of the Commission quite correctly emphasized, there is as yet no European national system of innovation. Europe seems rather characterized by a variety of different national innovation systems. Those systems each have their pecularities, as was illustrated in the empirical analysis in Chapter 2 of this report. To "mobilise" and connect these, eventually integrate them raises many structural challenges to the supply side of Europe's national RTD systems.

Yet as was highlighted in this report, if anything it is the supply side of the national systems of innovation which European countries appear to have relatively well under control. As expected, poorer member countries spend relatively less on higher education and research than richer member countries. As growth convergence between the different EU member countries continues and is further enhanced by economic and monetary integration, it can be expected that poorer countries will slowly catch up to the richer member countries higher levels of public and private investment in higher education and research. This process takes time. It can and has been enhanced by private capital transfers to poorer member countries under the form of foreign direct investment, and transfers of public funds through the European Structural Funds. The ERA will hopefully accelerate this trend and not induce the opposite with a further strengthening of the concentration of research activities in the existing, predominantly richer countries, core knowledge growth poles.

The balance between policies focusing on research and higher education excellence and policies focusing on the spreading and diffusion of knowledge – what we have tried to summarise here under the concept of "absorptive" capacity – is hence a priority issue of policy concern. It is a policy trade off which one finds reflected in the RTD policies of many member countries. It is also an area, which brings to the forefront the multitude of alternative institutional set-ups of RTD policies. Countries with a clear federal structure both outside of the EU, such as Canada, the US or Switzerland, as well within the EU such as Belgium, Germany or Spain provide interesting illustrations about the efficacy and institutional

[1] "Presidency Conclusions–Lisbon", http://ue.eu.int/en/Info/eurocouncil/index.htm

development of regional[2] based RTD policies, alternatively countries with a long tradition of regional clustering and networking of knowledge activities such as Italy point to the particular contribution of regional players in raising the "absorptive capacity" of particular local communities. Spatial proximity matters in other words, regions appear from this perspective, key players in global competitiveness. It is to this subject that we turn first.

4.1 RTD policies, competitiveness and employment: a new role for regional policies

Within the framework of further European integration, the international presence of most large multinational firms carrying out the bulk of European and world-wide, private RTD investments and innovation efforts, and the increasing international access to codified knowledge, the relationship between "national" RTD policies and "national" competitiveness becomes increasingly less relevant as policy aim. Competitiveness is in this sense something of the past, something "nationalistic" at odds with the increasing global markets on which RTD and innovation intensive firms are forced to operate today. While the notion might retain some value in positioning a country's relative cost efficiency e.g. in terms of unit labour costs, based on country wide wage negotiations, its real value will increasingly be at the regional level. Indeed, it is at the level of regions that designing appropriate RTD policies for competitiveness and employment provides the largest scope for policy learning and benchmarking. But before describing some of those, it might be useful to point to an additional justification from the European perspective.

Economic and social cohesion – usually defined in terms of equity considerations such as regional disparities or social inclusion – is a fundamental aim of the EU articulated in Article 2 of the Treaty. However, empirical research has shown that regional disparities in economic performance remain substantial, and have even increased within many member countries over the last decade[3]. This gap is especially marked as regards innovative activity. What appears is that there exists a subgroup of high R&D, high income regions in Europe with its own internal dynamics. What distinguishes these high R&D regions from the rest is mainly that RTD and innovation matter a lot in the former, while they are of little importance in the latter. There is thus, at least if the last decades are something to go by, a clear risk that a faster rate of innovation, vital for European growth and competitiveness in general, might further aggravate regional disparities.

Although data are scarce on many factors of potential relevance for regional growth (see also the case of Italian districts described in Chapter 3 and the Appendix), the evidence clearly indicates that most low-income regions have failed to exploit the potential for technology diffusion. It points to a need for policies aimed at enhancing the capacity of such regions to absorb new technologies, and indicators able to reflect the progress of such policies. The low rate of diffusion in those regions is often associated with a structure of activity dominated by agriculture or 'older' industries, and a corresponding lack of high-tech activities, often combined with relatively high unemployment.

[2] regional here means subnational level

[3] See amongst others European Commission (2001) The Second Report on Economic and Social Cohesion; Fagerberg, J. and B. Verspagen (1996), 'Heading for Divergence? Regional Growth in Europe Reconsidered', *Journal of Common Market Studies*, **34**, 431–48; Fagerberg, J., B. Verspagen and M. Caniëls (1997) «Technology, Growth and Unemployment across European Regions», *Regional Studies*, 31, 457-466. Also the Commission's Communication on the "Regional Dimension of the ERA" (COM(2001)549 final of 03.10.01

There is hence a clear need for RTD policies with a regional dimension and focus. Policies, which provide a much stronger mix of structural change and RTD. The regional aspects of the local system of innovation are in other words essential. It is, in the expert group's view, at this level that the analysis as illustrated in Figure 2.5 and 3.5 should ideallly be carried out. In some regions this might well imply a strong policy focus on local "attractors" strongly embedded in the local research capacity, in other countries on diffusion. The trade-off in regional RTD policies can be found in practically all European regions. Success and/or failure will strongly depend on local (and geographical) context conditions, the timing of the policy and the success in achieving regional "clustering" of economic activities. As the various cases analysed in Chapter 3 illustrate policies will often involve a mixture between specific and generic policies.

The most effective road to achieve the Lisbon and Barcelona targets is from this perspective the regional policy road. It is a policy road, which runs parallel with the one that focuses on regional differences in Europe. Here it is not enough to increase investment in education and research in some of the lower income regions in Europe. In these regions as well as in the new candidate countries there is a much stronger need to strengthen the absorptive capacity of the private sector. Subsidising hiring highly educated personel, supporting the establishment of private and public bridging organizations and giving access to risk capital need to be combined in order to valorize investments in the knowledge base (the same type of measures needed in most of the poor regions outside Europe).

Such measures are especially necessary when 'excellent institutions' in low-income areas are linked up on wider networks dominated by high income metropoles. Otherwise there is a risk for increased 'brain-drain' where local knowledge is used mainly outside its home region. Knowledge production is highly centrifugal and if left to itself the stronger emphasis on knowledge based production risks to increase regional income differences.

> *We recommend that the benchmarking exercise on the impact of RTD policies on competitiveness and employment is expanded in the direction of regional policy initiatives. Competitiveness and sustainable employment are policy aims, which in an increasingly integrated Europe are first and foremost notions, which obtain their true value within a regional context. Furthermore the creation of a European Research Area renders the need for such a regional benchmarking focus more relevant than ever, if one is to counter some of the unwarranted negative concentration effects of RTD in the richer, most knowledge intensive regions of the EU.*

4.2 RTD and innovation policies: in search of incentives and complementarities

It is of course the private sector of the economy, which has become the target certainly since Barcelona to raise its innovation performance most dramatically over the next five to ten years. In order to induce European businesses to increase their innovation efforts, they will need to be given a number of incentives. Policies as we saw in Chapter 3 can either focus directly on such incentives or on some of the essential complementarities. The list of incentives is to some extent rather well known: protection of intellectual property rights, the granting of temporary monopoly power, direct and indirect innovation support measures, the permission to cooperate and the rewards given to scientific achievements. They have all been introduced in various ways in the European Union member countries: some as we saw in

Chapter 3 can be described as cases of truly "best practice" but others inspired by very similar policy objectives, appear in a different policy framework examples of weak practice.

RTD policies are generally uneasily embedded in a number of typical micro-economic policy trade offs: stimulation of creation versus support for diffusion: subsidies to small and medium sized firms as opposed to large, often multi-national firms; and last but not least allowance, even encouragement of research and development collaboration between firms sometimes in cooperation with public research agencies (universities, public laboratories). Each one of these trade-offs is typically assessed differently over time. Today, with most large multinational firms having reduced significantly their long term, more fundamental research activities, the focus of most national and regional RTD policies have shifted towards the active support to networking and collaboration in research, technology and innovation, both within the research and within the industry sectors, and across the two. One may think of support to research consortia, the creation of centres of excellence, creating critical masses of research activities in specific areas. Similarly networking within business for innovation has been encouraged through cluster policies, while joint business R&D activities have also been the subject of policy support, not the least from the European level. Finally, the promotion of industry-science relationships has focused on the creation of intermediaries, of bridging and collaborative programmes, etc. Not surprisingly such policies have increasingly come into conflict with the two other trade-offs: competition policy and the implicit size bias in the support programmes. As a result incentive policies for business supporting the creation of new-technology-based firms has been developed: various types of subsidies, soft schemes, transfer programmes, venture capital funds, academic entrepreneurship promotion programmes, changes in IPR rules, etc. have been set up with public intervention, in order to create a better environment for new firm creation, notably for those founded on the exploitation of research results. This latter set of policies has led policy makers to become more aware of the specific deficiencies experienced by SMEs in their innovation trajectories. Because of their limited size, these companies often lack the critical mass to support all the necessary functions needed to innovate. Many "SME-specific" programmes have thus been set up at all levels (regional, national, European) whereby the definition of size is as diversified as are the programmes, but all aiming at addressing these barriers, and developing more favourable access conditions for companies under a certain size in more general support programmes. While each of these programmes has its own micro-economic justification, it is clear that many different sometimes contradictory policy aims lay behind their introduction and justification.

We hence remain hesitant to rank particular RTD policies on a best practice scale independent of the particular context within which these policies were designed, implemented and carried out. If benchmarking is primarily inspired by a desire to get quick and easy access to information on which to base action; to avoid to open up the black box, to get some meters to read and some handles to turn, it might possibly work if the "operator" is experienced and skilful, but not if he is a standard administrator with little insight in the specific policy field. Some phenomena are *more easy to register* and some *handles more easy to turn* than others. To restrict policy to easily registered success (e.g. the growth in indicators easily measured) and easily turned handles is of course a great temptation and may sometimes even be the only possible line of action. This gives priority to amounts of resources and flows rather than to qualitative characteristics and relationships. To register an increase in the amount of public investment in knowledge production is easier than to register a strengthening of linkages or an increase in quality. To pursue policies in areas where conflicts are not evoked is more easy than to pursue policies that attack privileges in private or public sector. Furthermore, for

historical reasons the *attention* is much stronger to certain phenomena than others. R&D has been measured and benchmarked for many years while the diffusion of organizational and management techniques have been neglected in the public policy sphere. In the recommendations under this heading we have tried to emphasize what tends to be neglected because it is difficult to measure or because it takes one into areas of conflict.

> *In benchmarking and assessing RTD policies care must be taken of the often contradictory policy trade offs which lay behind the original justification for the design and implementation of such policies. Those trade-offs change over time: the stimulation of the creation versus the support for diffusion; the support for small versus large firms; the stimulation of collaboration between private and public research are all policies which might at some time be justified, at other less. It is therefore essential to evaluate carefully at each moment in time the particular complementary needs. As a consequence, the expert group remains reluctant to rank particular RTD policies on a best practice scale independent of the particular context within which these policies were designed, implemented and carried out.*

4.3 RTD in "public" areas: in search of private and public incentives

But it would be a mistake to focus all the attention to policy measures directed towards the competitiveness of Europe's business community. The aim of RTD policies is not just to contribute to the efficient and internationally competitive and sustainable production of high quality products and services but also to contribute to the creation of high quality work places, to education and learning, to improve the health and living conditions of citizens, to realize global sustainability, to support the reproduction and renewal of cultural life in a democratic society.

Nearly as a corollary of the previous set of arguments policies should focus here on developing new, or expanding existing incentive schemes to raise RTD and innovation investment and knowledge diffusion in areas with a high social rate of return. Investment may come through private or public sources. Private firms, foundations as well as individuals typically invest much more in the US in such research activities (health, education, culture, environment) than in Europe where these fields are to some extent the responsability of the public sector. Such public funding efforts are of course a reflection of deliberate political choices. Thus, Europe's heavy public investments in health, social and welfare programmes are also a reflection of Europe's social and welfare achievements. The fact that on average the European citizen spends less on health and medical expenses (both of a public and private nature) as a percentage of GDP than the average US citizen illustrates from this perspective the relative success of Europe's social model. A similar statement with respect to higher education does, however, sound far less convincing. The public right to cheap higher education in many European countries, is very much likely to have reduced the private incentive for citizens and firms to invest in their own higher and technical education. The fundamental trade-off, one is confronted with is the notion that public investments in RTD areas with a high social rate of return are considered on the one hand political "achievements", reflections of the quality of life of the citizens, and on the other hand viewed as missed RTD investment opportunities: areas of high income growth areas in which citizens would actually like to invest but have no incentive to do so.

The expert group hence emphasizes the need to design incentive schemes for increased investment in RTD areas with a high social rate of return (education, health, environmental goals, culture). In some countries this might point to schemes specifically designed for the private sector, in other countries to individual citizens, to public/private partnerships or to the public sector itself.

People in Europe need to allocate more of their income and time to activities that enhance their competence and the same is true for firms and for government. In addition to the general arguments put forward above one may add the following: the growing complexity and speeding up of change which tends to devalue old competence more rapidly than before; the demand for knowledge stemming from citizens' need to understand what is going on in terms of cultural and societal change; the need for critical assessment and evaluation of the working of the institutions involved in the production and distribution of knowledge in order to enhance the social rate of return on the investments. The division of labour among universities, schools, civil society and private firms in knowledge production and distribution needs to be revised in many respects in order to adjust them to the new context.

> *There is a need to fully recognize the importance of the role of knowledge in socio-economic life in general, to understand how this role works and affects all aspects of life, not just competitiveness or work. Viewed in this way the national innovation system must relate to relevant knowledge in all its forms. Science and technology are vital parts of the innovation process and scientific and technological innovation is a vital element of industrial innovation. However, there are other dimensions as well. In an enterprise context, organisational, managerial, distribution, marketing and logistical innovations can be equally important. In a societal context, social, individual responsibility and expression of interest, participatory and communication innovations are equally important. Both contribute ultimately to long term growth and welfare and sustainable employment.*

4.4 On the need for RTD policy "creative destruction": towards a simple set of rules

Following from the conceptual and empirical analysis carried out above, it appears legitimate to ask whether current policy thinking is sufficiently radical. Many of the constituent parts of the European public innovation system, both in terms of overall institutions and individual programs and schemes, have a long, some would say "rich" policy history going back to the 1970s and 80s, if not earlier. While adjustments in overall institutional configurations have taken place, the essential operational features of the schemes have remained broadly similar. Present policy analysis, with the partial exception of the most radical interpretation of the "European research area" tends to take these structures as largely a given, and to consider their individual impacts or how they might work better.

There are, however, dangers with this approach. The national, European and international economic and in particular science, technology and innovation environment has greatly altered. There is a danger that policy thinking in member-states and regions might not be sufficiently responsive to such changes and more geared towards its own influence and survival than to the adjustments and adaptations needed. Furthermore the national imitation and copying strategies followed over the years have led to a continuous adding of national, regional and European policy measures and initiatives so that it is sometimes difficult today to see the systemic logic of most national policies. It is hence not surprising that as illustrated in Chapter 3, we find in many member countries broadly similar policies, at least by name,

which sometimes appear in one member country case an ideal example of a "best practice" and in another member country case nearly as perfect an example of "worst practice". Furthermore, there is, apart from the lack of systemic transparency of RTD policies increasingly also a certain degree of administrative policy overlap, with currently only a set of negative funding structure rules – the matching and competition rules imposed by EU legislation. It seems time to come back to some of the subsidiarity principles in giving priority to the design and implementation of RTD policies to regional, national and European policy makers. The specific case of Belgium (reviewed in the Appendix) might actually be helpful here: the more local technology and innovation policies are designed and carried out by the regions, they are likely to benefit greatly from careful benchmarking exercises; the (higher) education policy initiatives are the responsibilities of the language communities; fiscal and some other specific policies the responsibility of the national government. Effectively such a distribution of policies has already taken form with many policy areas having shifted to EU level such as intellectual property, the European patent. However, it would be useful to design a more optimal subsidiarity structure of RTD policies.

In conclusion it can be argued that regional, national and European RTD policies seem ready for a major shake-up, following some simple basic principles.

> *The systemic framework suggested in the present Report provides in the view of the Experts Group a set of relatively simple basic guiding principles. First, policies aimed at reinforcing particular constituents should be targeted at the weak parts of each constituent; policies aimed at bridging should focus on the weak linkages or some of the unwarranted trade-offs implicit in reinforcing policies and actions of the past. Second, given the oversupply of individual policy schemes, often run on an isolated and independent basis and inherited from the past, we suggest that any new scheme introduced in the RTD policy area must be accompanied by the winding down of at least two existing schemes. Third, the systemic approach suggested here implies that with respect to R&D programme evaluation, there should be less emphasis on separate programme-by-programme evaluations, and more on processes and on firm and sector-focused impacts.*

4.5 Benchmarking lessons: On the generic nature, transferability and robustness of best-practices

The conceptual analysis presented in Chapter 1 suggests that the assumption that there is one single best-practice RTD-policy in a specific field when it comes to stimulate employment and strengthen competitiveness appears difficult to be maintained. The benchmarking exercise of RTD-policies should therefore introduce a number of new concepts which we suggest would qualify as a best practice:

- First, how *generic* is the practice. Is it independent of the institutional, sectoral and geographical context or is it part of an integrated system? This corresponds in technical jargon to stand alone versus systemic components and relates to the limits of modularisation.
- Second, how *transferable* is the practice. A practice that works well in many different contexts may still be difficult to transplant from one context to another. Hearts work in all people but they might be hard to transplant from one human body to another.

- Third, how *robust* is it. Can it be expected to remain a best practice over time also when new modes of production and innovation enter the scene.

From the similarities in the list of national policies in Table 3.1 it appears clear that many actual policy practices that seem to work well in specific contexts (they are reasonably generic), have been successfully transplanted, imitated and copied and seem to have become reasonably robust – they have worked well for a longer period. But there are also policy instruments that have proved to be non-generic, non-transferable and non-robust.

As the analysis in Chapter 3 (section 3.3) illustrated generic, robust and transferable practices prove to be procedural and institutional rather than very specific forms of government intervention. Different institutional solutions could be found in different countries. The case studies discussed in Chapter 3 as well as the country studies carried out and summarized in Appendix B highlighted the diversity of RTD policies in use, their different biases and possible weaknesses. They did not, however, tell us much about the generic, robust or transferable nature of such national or regional policies.

From this perspective a pre-requiste for "intelligent" benchmarking is, in the Experts Group view that governments (national or local) have established:

- *institutions/mechanisms that help to sort out what are generic and robust trends rather than policy fads and fashion.*
- *institutions/mechanisms that help to define the specialisation and institutional set up of national innovation system as well as its strengths and weaknesses from a comparative perspective.*

4.6 Data and methodological issues.

Intelligent benchmarking as described above requires of course data on a wide number of issues. The data which were made available within the context of this study allowed us to conduct only a rough empirical analysis. It will be clear that the quality of the analysis in this area depends crucially on the availability of appropriate data. That data covers both performance as well as policy indicators. As governments take a more active part in building up the appropriate amount of knowledge in their economies, e.g. through the provision of tax incentives, direct aid to research, but most of all through adjusting the institutional framework within which firms operate: the rules of competition, the educational system, the protection of intellectual property rights and regulations, indicators on such variables are badly needed.

Furthermore, an understanding of innovative capacity, and in particular of *national differences* in innovative capacity and the capacity to undertake successful *cross-national* innovations requires a much more rigorous and discrete modeling approach. New theoretical advances in supermodularity and econometric testing for it actually allow for more in depth study of the existence and role of complementarities between discrete structures. The benchmarking of RTD policies offers from this perspective an ideal framework for such analyses. As the theoretical and empirical analyses carried out in Chapters 2 and 3 illustrate a systemic vision with respect to the (inter-)national innovation process requires also a more comprehensive methodological framework when addressing the efficacy of RTD policies. To

what extent are incentives to innovation are interrelated? Can one be changed in isolation without changing the others? Or are they interdependent, each being a building block in a system? If so, an innovation policy should build around a system of mutually compatible and reinforcing incentives. From this perspective benchmarking has so far been strong on policy rethoric but poor on methodology.

> *We recommend an in depth research programme on the methodology of benchmarking including the collection of the appropriate data needed for such regular activities. There are as we have argued in this Report both methodological as well as empirical questions which can be raised with respect to the current wave of politically inspired benchmarking exercises. The success of the open method of coordination depends by and large on the soundness of the underlying methodological framework used in benchmarking and the active search for improved and more appropriate measures and indicators in the various relevant areas.*

4.7 RTD policies in services and the "weightless economy"

We discussed in this Report only briefly the role of intangibles and of RTD and innovation in the service sectors as new methodological and conceptual challenges for both RTD policy, competitiveness and employment. The limited attention to these issues, highlights actually the continuous overriding importance given in most countries and regions as well as the EU, to industrial RTD and innovation. Such importance is increasingly unjustified as services and other non-industrial activities play a growing role in international competitiveness and have for decennia now been the dominant sector of employment in most EU countries. We briefly discussed in Chapter 1 the underlying reasons for such a neglect. One main reason, which we would like to bring to the forefront here, is the need for reliable information in this area. Just as industrial R&D data are very much something developed in the 60's, culminating in the Frascati manual, and innovation data something developed in the 80's, culminating in the Oslo manual, it is now time to develop data on RTD and innovation activities in services.

As is well-known, despite major efforts, especially over the last decade, there is still considerable weakness in the data resources with which one can address aspects of the weightless economy. Though it has often been said before, and though the situation is slowly improving, documentation concerning services industries still remains well behind that for manufacturing. While we do now have data for (only some) services in the Community Innovation Surveys, there is reason for thinking that these survey instruments are inadequate to deal with the particular features of services innovation (see, for example, Tether, 2002). As with so many RTD and innovation indicators they have been forged with manufacturing sector practices in mind – arguably, with a subset of these practices, to boot. Though one may sympathise with statisticians' desire to maintain data comparability over time, there is need to take such criticisms far more seriously than has so far been the case.

The same holds for the measurement of intangibles. One rapidly growing concern relates to the need for international standardisation in reporting of companies. From an international accounting perspective, this is an important issue further exacerbated by the growing concerns about possible mal conversations that have so dramatically shaken the US and international business world. There is now an urgent need to go beyond institutional "battles" such as the one between the US GAAP and the IASC regulations. To some extent the international business community will choose itself the dominant accounting standard. Daimler Chrysler,

for instance, though largely a European Group, chose to adopt US GAAP norms instead of the IASC ones, primarily because of its need to get easy access to US financial markets and the NY Stock Exchange in particular. Others are likely to follow. This is one of the very 'tangible' effects of globalisation on corporate behaviour with respect to intangibles. Reporting in corporate accounts of intangibles remains, however, a complex and difficult matter, which has been further questioned by the dramatic collapse of Enron and its reverberations in the scrutinising of Xerox and many other firms, and the more recent Worldcom case.

Many questions remain hence open with respect to the formal reporting of intangibles. We know the importance of information as signalling for economic agents. From this perspective, the role of information on intangibles as a public good is obviously significant. The question can hence be raised whether public authorities, especially at the European level, should provide a specific effort dedicated to collecting and diffusing information on intangibles? Should the ongoing efforts by Eurostat be consolidated and in which form? What should be the status of information on intangibles? If more standardised information has a more public good 'status', then there are probably initiatives to be taken at this level. We only touched briefly upon these and other issues with respect to reporting in this report, but it is clear that the debate on these issues are also likely to dominate the RTD measurement agenda of the coming years.

> *We recommend a major statistical and policy initiative on the standardization of the measurement of RTD and innovation activities in services. That initiative should also include the many methodological, empirical, international standardisation issues involved with respect to "intangibles".*

Conclusions

This report has delivered a number of key messages on the relationships between Research, Technology, Development and Innovation, on the one hand, and socio-economic development, on the other. In a nutshell, these arguments are as follows:

- There is a need for a **systemic approach** to understand the relationships between STI and socio-economic development: there is no simple one-way relationship between a "knowledge producing" sector and a "knowledge absorbing" sector;

- Besides nodes in the innovation systems, **flows** are of paramount importance, since **diffusion** of knowledge and the spillovers processes, combined with excellent absorptive and **learning** capacities of agents in the system, are key towards the creation of performing innovation systems;

- In accordance, identification of the **weakest links** in systems is of primary importance, because these could hamper the functioning of the system as a whole. The role of intermediaries is also enlightened, as bridge-makers or facilitators between elements of the system;

- Evolutionary approaches mean that situations are always **context specific, path-dependent** and that changes are in their majority of an **incremental** nature, although "snake" behaviour exists and reflects moments of more radical innovation;

- **Human and social capital** are the necessary oil in the system.

These changes should ideally also be reflected in RTD policies. If we compare the recent evolutions in Science, Technology and Innovation policies with the main arguments put above, we see indeed a number of convergence areas (OECD, 2000)[4]. Those evolutions can be characterized by the following main trends:

1. Policies put an increasing focus on the **stimulation of the knowledge flows in the systems**, through **support to networking and collaboration in research, technology and innovation**, both within the research and within the industry sectors, and across the two. Examples of the former types of policies are support to research consortia and creation of centres of excellence, creating critical masses of research activities in specific areas. Networking within business for innovation is encouraged through cluster policies, while joint business R&D activities also are subject of policy support, not the least from the European level. Finally, the promotion of industry-science relationships is a long standing focus of STI policies, and many programmes are designed with such an objective in mind: creation of intermediaries, of bridging and collaborative programmes, etc. ***We suggest that such policies have their highest efficacy and contribution to global competitiveness and sustainable employment when implemented at the regional level***.

2. Incentive policies for business. **Supporting the creation of new-technology-based firms** is a more recent, but much developed area for policy intervention: various types of subsidies, soft schemes, transfer programmes, venture capital funds, academic entrepreneurship promotion programmes, changes in IPR rules, etc. are set up with public

[4] OECD (2000), Science, Technology and Industry Outlook 2000, Paris.

intervention, in order to create a better environment for new firm creation, notably for those founded on the exploitation of research results.

3. It is recognised that **human capital is the key in a knowledge –driven economy** : reducing skills mismatches and enhancing labour mobility, both between science and industry and internationally, receive a lot of policy attention in the majority of EU countries.

4. **Reinforcing the science base**, through a renewed commitment to fund scientific research, goes along with reforms of the science base, incorporating the following moves: more autonomy of research organizations but also more accountability, more competition in funds allocation, and also growing demand for linkages with users of research results.

5. **Tackling the specific deficiencies experienced by SMEs** in their innovation trajectories is a frequent point of attention of policies: because of their limited size, these companies often lack the critical mass to support all the necessary functions needed to innovate. Many "SME-specific" programmes aim at addressing these barriers, and favourable access conditions are designed for companies under a certain size in more general support programmes.

There are also changes in the modes of implementation of policies. Here, the recent years have witnessed the following new orientations :

6. **Policy frameworks** are being enhanced, through a more reflexive process for policy design, more widespread evaluation practices, and an increased attention to policy outcomes and impacts. Here the use of "intelligent benchmarking" practices, involving context-related policy comparisons rather than the copy of best practices, can play a vital role to nurture the above new developments;

7. **Society participation in policy design** is favoured through consultative and prospective exercises, establishment or reinforcement of advisory bodies, etc. Generally speaking, STI is put higher on the policy agendas, as it is more and more recognised as a legitimate area for policy intervention, in the view of enhancing competitiveness of the economies, albeit in a longer-term perspective.

The above picture presents a maybe somewhat optimistic view on recent policy developments: each trend is not active to a similar extent for all countries, far from it. But it can be seen that, overall, the accent on the linkages in the system is well present in policy action. The accent on SMEs and NTBFs creation, as well as on ISR, reflect the idea that the weakest links in the system should be enhanced in priority, although it is not always ensured that the observed policy priorities are defined according to the results of thorough analyses of the innovation systems. The argument that the policies should be context-dependent is well in line with a relatively new accent on the improvement of policy design processes (evaluation, use of empirical evidence for policy building, more inclusive modes of policy making, etc.). The reinforcement of the science base is also in line with the importance recognised to the creation of new knowledge in the system, provided of course that this is accompanied with other moves towards the creation of linkages between this science base and the rest of the system. The necessary accent on human resources is perhaps the major area where policy developments need more attention in the future.

Thus, it can be said that a new “theoretical” agenda for policy making in the RTD area is already identified, but that it will only be put in practice fruitfully if “policy intelligence” capabilities are enhanced, so that the elements of the RTD policy portfolio (and the shape of this portfolio as a whole) are fine-tuned to the reality of the innovation system in which they operate. In short, in policy making too, knowledge will not be used despite all efforts to "distribute" knowledge such as this report of a group of experts if there is no matching learning capacity.